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EFFECTS OF HIGH POWER TRANSMISSIONS ON GOODYEAR ELASTOMERIC DOM--ETC(U)

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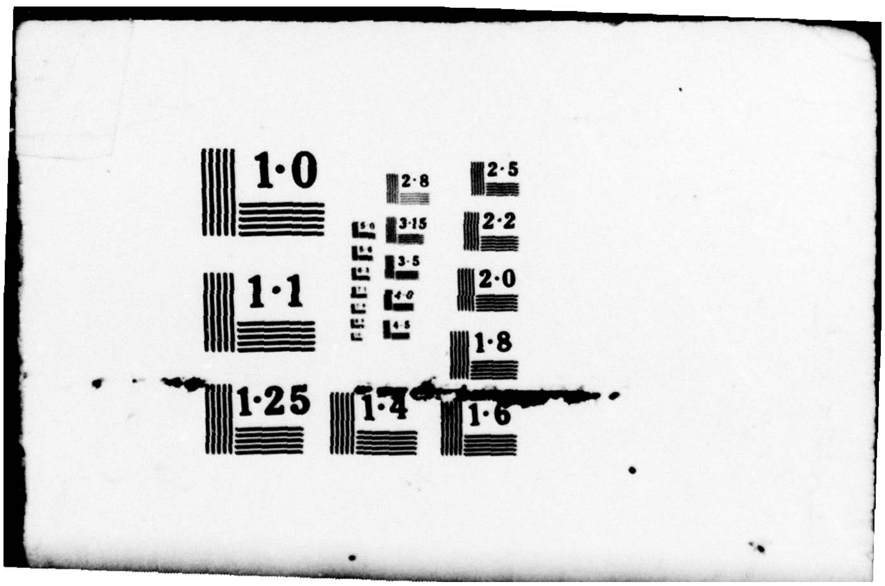
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U.S. NAVY UNDERWATER SOUND LABORATORY
FORT TRUMBULL, NEW LONDON, CONNECTICUT

6 EFFECTS OF HIGH POWER TRANSMISSIONS ON GOODYEAR ELASTOMERIC DOME PANELS.

By

10 Julius O./Natwick

USL Technical Memorandum No. 933-341-64

11 15 October 1964

12 6p.

INTRODUCTION

The Goodyear Aerospace Corporation, under BUSHIPS Contract No. NObsr-91065, has been determining the critical factors that affect the design, fabrication, installation, and test of a reinforced elastomeric sonar dome window for a bow-mounted AN/SQS-26 sonar transducer. The proposed dome is to be water-filled and pressurized to withstand anticipated service conditions.

In support of this study, Goodyear made arrangements with the USN Underwater Sound Reference Laboratory for the measurement of the acoustical characteristics of several elastomeric panels. After these measurements were completed, Goodyear treated the surfaces of two of the panels with antifoulant materials and sent the panels to USL for exposure to the same high-level sound pressures that are experienced by the AN/SQS-26 sonar dome. The purpose of this exposure was to test if the high acoustic energy was deleterious to the elastomeric materials.

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Reference (a) describes the equipment and procedures that were used for these tests. Reference (b) reports on the acoustic measurements that were made by USRL on the panels before the high-power transmission tests.

TEST PANELS

Description

Goodyear panel No. 375-3/2 (USL No. 135) is 5 feet high by 5 feet wide by 1.660 inches thick. It has a total of 17 plies (9 straight and 8 biased) and 10 reinforcing cords per inch. Goodyear panel No.

933-341-64

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Encl (1) to USN/USL ltr ser 933-342 of Oct. 1964

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378-3/1 (USL No. 136) is 5 feet high by 5 feet wide by 0.850 inches thick. It has a total of 7 plies (4 straight and 3 biased) and 14 reinforcing cords per inch. Reference (c) contains additional details concerning the construction of these panels.

The outside and the transducer side of panel 375-3/2 are shown in Figures 1 and 2, respectively: The outside and the transducer side of panel 378-3/1 are shown in Figures 3 and 4, respectively.

Antifoulant Treatment

As shown in Figures 1 through 4, the transducer side and the outside of each panel were divided into 3 equal areas with apexes meeting at the center of the panel.

The upper left-hand area on the outside of each panel was coated with Goodyear Formulation S64F302W; the area directly behind, on the transducer side of the panel, was coated with the same material. A closeup view of antifoulant S64F302W on panel 375-3/2 is shown in Figure 5. The upper right-hand corner on the outside of each panel was coated with Goodyear Formulation S64F302, a rubber base coating, as was the opposite area on the transducer side of the panel. The lower area across the bottom on both sides of each panel was left uncoated to serve as a standard for comparison purposes.

Framework Support

During the tests, the panels were supported so that they were not in tension because of their own weight.

The support consisted of a framework that clamped the edges of the panels between aluminum angle and flat bar shapes. The bolts that held the assembly together passed through close-fit holes in the panels.

TESTS

Panels 375-3/2 and 378-3/1 were each exposed to 200 hours of high-power transmissions at the Dodge Pond Field Station, a fresh water pond. Panel 375-3/2 was tested during the period 20 March 1964 through 12 April 1964 at a water temperature of about 45 degrees Fahrenheit; panel 378-3/1 was tested during the period of 14 April 1964 through 1 May 1964 at a water temperature of about 46 degrees Fahrenheit.

Thermocouples were inserted into both panels to measure any possible marked increase in the temperature of the material because of the transmissions. Locations were selected in areas that could be particularly vulnerable to damage by the transmissions. Four thermocouples were inserted in an area about the center of panel 375-3/2. Three thermocouples were inserted into panel 378-3/1; these thermocouples were located at the top left, center, and bottom right of the panel, as viewed by one facing the transducer side of the panel. A reference thermocouple was located away from the effects of the array. The temperatures within the dome material were measured a number of times on each panel for periods ranging from 7 through 30 hours of continuous operation; they were recorded on a Minneapolis Honeywell Regulator Company Model 153 X 62-P-12-II-III-26 12-point temperature recorder.

RESULTS OF TESTS

The only visible effects on the panels that appeared to have been caused by the high-power transmissions were slight changes of color to a lighter shade and of the surface to a smoother finish. Figure 6 shows the only area of panel 375-3/2 that was affected; it is located on the transducer side about in the center of the panel in the bare area. The transducer side of panel 378-3/2 also had an affected area that was about 4 inches in length by 2 inches in height at about the same location as that shown on panel 375-3/2. Some of the S64F302W antifoulant flaked off on both sides of both panels; Goodyear representatives expected this to happen inasmuch as it was only a wash coat that was applied to test how much antifoulant would be retained by the panel.

There was no noticeable increase in temperature within either panel due to the transmissions.

OTHER TESTS

As requested by Goodyear, USL shipped the panels on 24 July 1964 to the USN Underwater Sound Reference Laboratory in order to obtain data for comparison with those acoustic characteristics that USRL measured before exposure to the transmissions.

Julius O. Natwick

JULIUS O. NATWICK
Senior Project Engineer

List of References

(a) Julius O. Natwick, "Test Method for Evaluating Sonar Dome Coatings," USL Technical Memorandum No. 933-0153-64 of 19 June 1964 (CONF)

(b) USN Underwater Sound Reference Laboratory, "Calibration Report No. 2131 of 3 February 1964."

(c) Goodyear Aerospace Corporation, "AN/SQS-26 Sonar Dome Window Study," Monthly Progress Reports No. 1 of 5 December 1963 and No. 2 of 2 January 1964.

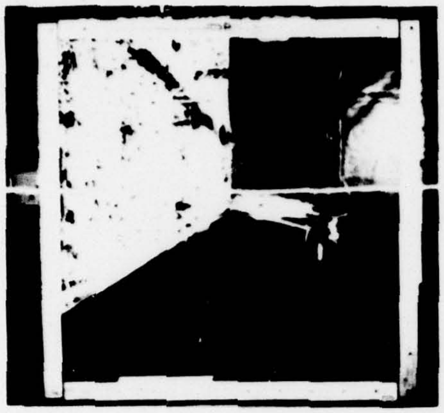

Fig. 1

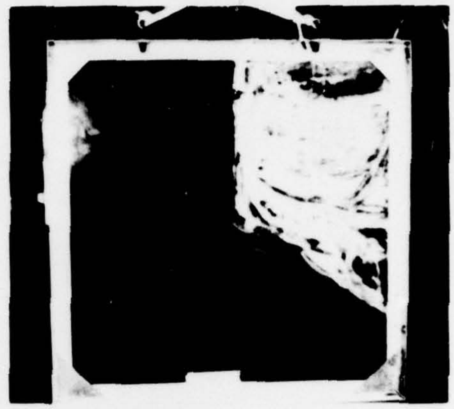

Fig. 2

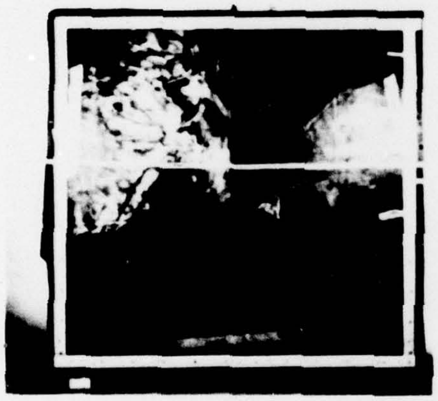

Fig. 3

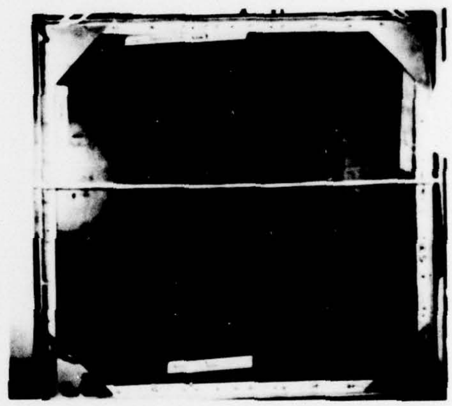

Fig. 4

Fig. 5

Fig. 6

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